Flight Records of Phyllophaga (Coleoptera: Scarabaeidae).

By H. K. Henry, Biology Department, Haverford College, and C. E. Heit,* New York State Conservation Department.

Due to a heavy infestation of white grubs, larvae of *Phyllophaga* and other phytophagous Scarabaeidae, in the seed beds and transplant areas of the Saratoga Forest Tree Nursery, Saratoga Springs, New York, the Conservation Department of the State authorized a study to be made of the biology of the species present with the hope that improved methods of control might be obtained. From a count of adults taken in light traps flight records were obtained more complete than any others seen by the authors and are given here for the use of those working in the same field.

The original equipment for the study consisted of 16 light traps of the electrocutor type. The traps were hung from wooden uprights with the light source, a 75 watt inside frosted bulb, about 7 feet from the ground. The traps were set out in two rows 75 feet apart each way and covered approximately 2 acres of seed beds. After the first year funnel type traps were substituted for the electrocutor type and either 100 or 150 watt daylight bulbs for the 75 watt. At the beginning of the 1937 season each alternate trap was removed, reducing the number of traps to 8 but giving approximately the same coverage to the seed beds.

During the five years covered by this record 14 species of *Phyllophaga* were taken in the traps of these one species, *P. longispina*, has not been recorded previously from the state and three others, *P. gracilis*, *P. forsteri* and *P. hirsuta* were listed only from stations in the vicinity of New York City. The species and number of each taken are given in Table 1.

The traps were operated intermittently during the first warm weather of spring and continuously after the first catch. They then remained in continuous nightly operation until no beetles were taken. The traps were examined each morning and the

*Mr. Heit is at present connected with the N. Y. State Agric Experiment Station at Geneva, N. Y.

Table 1.

YEARLY RECORD OF PHYLLOPHAGA.

Species	1934	1935	1936	1937	1938
P. gracilis	8719	1279	3141	[2] 54	[2]1790
P. tristis	[1]532	266	6790	187	888
P. crenulata	[1]509	857	552	[2]797	[2]297
P. fusca	[1]237	1470	29	161	272
P. fraterna	[1]364	274	49	[2]1050	[2]102
P. anxia	[1] 14	463	59	105	49
P. longispina	10	30	13	10	38
P. marginalis	2	5	9	2	2
P. hirticula	7	0	0	10	0
P. drakei	0	5	9	1	0
P. hirsuta	6	0	0	0	0
P. fosteri	1	0	0	0	0
P. balia	1	0	0	0	0
P. ilicis	0	0	0	1	0
	10402	4649	10651	2378	3438

sex and species of each beetle determined. Difficult specimens were identified by Dr. R. D. Glasgow, New York State Entomologist. The flight period at Saratoga Springs of the 14 species as determined by light trapping is given in Table 2.

Table 2.

FIRST AND LAST DATES OF CAPTURE AND LONGEST FLIGHT.

Species	First	Last	Longest Flight Period No. of Days	Year
P. crenulata	May 6	Aug. 21	101	'36
P. fusca	April 27	July 19	78	'38
P. fraterna	May 8	Aug. 9	84	'34
P. anxia	April 27	July 9	74	'35
P. tristis	May 6	July 7	63	'38
P. gracilis	July 7	Sept. 4	62	'34
P. longispina	May 11	July 10	45	'35
P. marginalis	June 6	July 21	40	'35
P. hirticula	June 4	July 21	39	'37
P. drakei	April 10	June 18	39	'36
P. hirsuta	June 16	June 18	3	'34
P. balia	June 2	June 2	1	'34
P. fosteri	July 5	July 5	1	'34
P. ilicis	July 3	July 3	1	'37

[1] Trapping not begun until after probable beginning of flight period.
[2] Trapping discontinued before probable end of flight period.

The extreme length of the flight periods indicated in Table 2 is in a way misleading, as throughout part of the period only stragglers were taken. The bulk of each species was captured in a relatively short time. Table 3 shows the period during which ninety per cent of the individuals of the six most numerous species was taken.

Table 3.

Period during which Ninety per cent of the Flight Occurred.

Species	Period	Length in Days
P. crenulata	5/10-7/10	51
P. fraterna	5/22-6/30	40
P. anxia	5/4 -6/9	37
P. fusca	5/20-6/14	25
P. tristis	5/8 -5/28	21
P. gracilis	7/11-7/31	21

With a view to possible control of grubs through capture of females the sex of each specimen was determined and a record kept for each species. Table 4 gives the data for the six most numerous species.

Table 4.

Total Catch.

			Per Cent	
Species	Males	Females	Males	Females
P. fraterna	1666	173	90	10
P. gracilis	13285	1698	88	12
P. tristis	5881	2782	78	22
P. crenulata	2364	648	77	23
P. fusca	1023	1146	47	53
P. anxia	327	363	47	53

An apparent difference in reaction to light is shown between the species of *Phyllophaga*, but here again the table may be somewhat misleading. The species in which a slightly greater number of females than males were taken were the species whose grubs occurred in greatest numbers near the traps. The greater number of males taken for the other species may well be an indication of the tendency of the males to aimless and greater flight than the females, rather than a greater phototropic response in the males. It is certainly true that although some grubs of all the species were found in the lighted area,

the number of grubs of the first four species of table 4 were never present in the abundance which the catch of the adults would have suggested.

In a light trapping experiment over a period of five years at Saratoga Springs, New York, 14 species of *Phyllophaga* were taken. Their flight periods varied from 101 days to 39 days with a total flight of over four months. In two of the species, *P. anxia* and *P. fusca* females were taken in slightly greater numbers than the males.

Four New Polydesmoid Millipeds from North Carolina (Myriapoda).

By Ralph V. Chamberlin, University of Utah, Salt Lake City.

Of the four species described in the present paper, the first three are based upon material collected by Prof. A. S. Pearse in the Pisgah National Forest, North Carolina, in 1933. The *Brachydesmus* is based upon specimens collected by Dr. Wm. S. Cornwell in 1934 and by Mrs. Nelle B. Causey in 1939 on the Duke University grounds. The holotypes are retained by the author. Paratypes of *Mimuloria furcifer* and of *Apheloria waccamana* are deposited at the Philadelphia Academy of Sciences.

Mimloria furcifer new species (Fig. 1).

A clearly larger species than *ducilla*, distinguishable at once in having the spots of the middorsal line shorter, subcircular, instead of extended along caudal border and ordinarily reaching light areas of the keels; dorsum in types dark chocolate to nearly black except for the median spots and the subquadrate spots on the keels which are yellow. In the preserved specimens the legs are yellow, the antennae chocolate brown.

This species in the form of the gonopods of the male is very similar to *ducilla*, but is at once to be separated by the presence of a distinct angulation on the upper edge of the telopodite whereas in *ducilla* that edge is smoothly curved. See further figure 1.